PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-091883
(43)Date of publication of application : 28.03.2003

(51)Int.CI. G11B 7/26
G11B 7/24

(21)Application number : 2001-283134
(22)Date of filing : 18.09.2001

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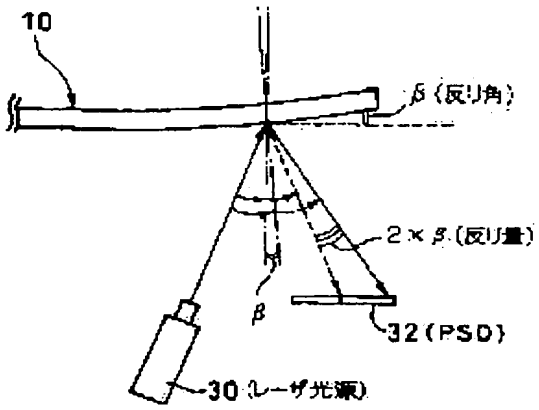
(54) METHOD FOR INSPECTING OPTICAL RECORDING MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To inspect, in a short time, warpage of an optical recording medium caused by expansion and contraction of a light transmission layer due to steep change of temperature, in the optical recording medium having a substrate and the light transmission layer having comparatively thick thickness.
SOLUTION: The optical recording medium 10 is formed by providing a reflection film 16, a recording layer 20 and the light transmission layer 24 consisting of resin having about 100 μm thickness on the substrate 12 made of polycarbonate. The optical recording medium 10 is preserved in an atmosphere of 60-80°C for ≥60 min and then taken out to an environment of normal temperature to measure the changed amount of the amount of warpage within 60 min.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

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CLAIMS

[Claim(s)]
[Claim 1] The inspection approach of the optical recording medium characterized by wearing the information recording surface formed in the support base, taking out by the room temperature environment after saving the optical recording medium with which the light transmission layer is prepared at least more than for 60 minutes in an ambient atmosphere 60 degrees C or more, and measuring change of the amount of curvatures of an optical recording medium.
[Claim 2] For said room temperature environment, 23**2 degrees C and relative humidity are the inspection approach of an optical recording medium that it is characterized by temperature being 50**10%RH in claim 1.
[Claim 3] The inspection approach of the optical recording medium characterized by the thickness of a light transmission layer being 20-150 micrometers in claim 1 or 2.
[Claim 4] It is the inspection approach of the optical recording medium characterized by being the variation of the amount within 60 minutes of curvatures after change of the amount of curvatures of said optical recording medium is taken out by the room temperature environment in claim 1 thru/or either of 3.
[Claim 5] The inspection approach of the optical recording medium characterized by taking out said optical recording medium by said room temperature environment, and measuring at intervals of 1 minute in claim 1 thru/or either of 4 till for 10 minutes after measurement initiation of change of the amount of curvatures.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the amount change inspection approach of curvatures of an optical recording medium.
[0002]
[Description of the Prior Art] Optical recording media (disk), such as the conventional CD (Compact Disc) and DVD (Digital Versatile Disc), are manufactured so that it may become in the condition (initial state) of having been manufactured, in the specification the property (an electrical property and mechanical characteristic) was variously decided to be, and it is further defined as a property satisfying a value of standard variously also after accelerated tests, such as a high-humidity/temperature preservation test, over a long period of time for the guarantee of dependability. It is required as one of the indexes of dependability over a long period of time [this] that the amount of curvatures of the entire disk in accelerated test order should be less than constant value. Such conventional CD, conventional DVD, etc. consist of a light transmission nature substrate (light transmission layer) which mainly consists of a polycarbonate. The main cause of curvature Said polycarbonate substrate, A recording layer, a reflecting layer, a protective layer, and at least when are constituted possible [record], and it is constituted further only for playbacks, at least A reflecting layer and a protective layer, Furthermore, when it had a printing layer, the accelerated test (high-humidity/temperature and accelerated test only according to an elevated temperature or a highly humid chisel) was carried out as a trial which checks dependability over a long period of time [since / said] by the balance of the stress by telescopic motion including it, and sufficient management was carried out.
[0003] On the other hand, a record playback layer is prepared in record and/or a refreshable condition on a support base, a light transmission layer is formed on it, and the optical disk (optical recording medium) it was made to irradiate the laser beam which performs record/playback from this light transmission layer side is proposed so that it may be indicated by JP,1996-235638,A.
[0004] Here, the case where the film made of resin is prepared through a glue line as said light transmission layer is proposed, and the proposal at the time of preparing the resin layer of an energy-line hardening mold or a heat ray hardening mold with a spin coat method is also made to others. In these, I thought that it was for expanding as main causes by which generating and stress balance of curvature collapse when the stress relaxation and the support base of each class, and a resin layer absorb moisture.
[0005]
[Problem(s) to be Solved by the Invention] However, this invention persons discovered that change of the big amount of curvatures occurred immediately after said accelerated test, when the quality of the material of said light transmission layer was [the thickness of a light transmission layer] 20 micrometers or more further unlike the quality of the material of said base material.
[0006] Immediately after this accelerated test, change of the amount of curvatures arises in an optical recording medium. When change of such an amount of curvatures takes out an optical recording medium after elevated-temperature preservation and cold storage (for example, 80-degree-C 12 hours) (-20-degree-C 12 hours) and the amount of curvatures is measured in a room temperature environment, change of said big amount of curvatures is measured as a steep change in a short time. The trouble that possibility of generating when an optical recording medium is carried into the room suddenly warm in the time of carrying an optical recording medium into the room whose air conditioning was suddenly [from outside] effective on the day of summer when the steep curvature in such a short time is hot, for example, and cold winter is high, and a drive can be equipped with while it is for a while in this case, an optical recording medium, or it cannot be used arises.

[0007] However, by the above-mentioned conventional accelerated test approach, since the optical recording medium was to be left under drawing and an at least 48-hour or more measurement environment from an accelerated test environment, change of said steep curvature generated in an optical recording medium was not able to be found out.
[0008] This invention is made in view of the above-mentioned trouble, and it aims at offering the amount change inspection approach of curvatures of the optical recording medium which is a short-time inspection and enabled it to detect efficiently and certainly the curvature generated by the steep temperature change in a short time.
[0009]
[Means for Solving the Problem] Said light transmission layer wholeheartedly this invention person as a result of research In the case of the thickness more than fixed When coefficient of linear expansion differs from said base material, and a high-humidity/temperature accelerated test, Expansion by the resin by the stress balance of each class, such as curvature, a polycarbonate, and an acrylic, absorbing moisture precedes curvature generating of a cause. It discovered that there was steep curvature generating in a short time by the temperature change, and found out that steep curvature generating in this short time was certainly
[efficiently and] detectable with a short-time trial.
[0010] That is, the above-mentioned purpose is attained by the following invention.
[0011] (1) The inspection approach of the optical recording medium characterized by wearing the information recording surface formed in the support base, taking out by the room temperature environment after saving the optical recording medium with which the light transmission layer is prepared at least more than for 60 minutes in an ambient atmosphere 60 degrees C or more, and measuring change of the amount of curvatures of an optical recording medium.
[0012] The information recording surface said here also calls it an information record section, and the recording layer area part in the time of membrane formation of the recording layer to a support base top and/or a reflecting layer being completed at least and a reflecting layer area part are shown.
[0013] Moreover, although an environmental change etc. was later explained to the example as the rapid temperature change variously at the detail, the temperature change 1 degree C / more than min was made into the rapid temperature change here.
[0014] (2) The inspection approach of the optical recording medium of (1) characterized by having made temperature of said ambient atmosphere of said optical recording medium into 70 degrees C or more, and considering the reserve time as the above for 60 minutes.
[0015] (3) Thing (1) which makes temperature of said ambient atmosphere 80 degrees C or less, or the inspection approach of the optical recording medium of (2).
[0016] (4) said -- a room temperature -- an environment -- temperature -- 23 -- **-- two -- degree C -- relative humidity -- 50 -- **-- ten -- % -- RH -- it is -- things -- (-- one --) -- (-- two --) -- or -- (-- three --) -- an optical recording medium -- inspection -- an approach .
[0017] (5) The inspection approach of the optical recording medium of either (1) characterized by the thickness of a light transmission layer being 20-150 micrometers thru/or (4).
[0018] (6) The inspection approach of the optical recording medium of either (1) characterized by what was constituted by the quality of the material from which the coefficient of linear expansion of said light transmission layer and said support base differs thru/or (5).
[0019] (7) Said light transmission layer is the inspection approach of one optical recording medium of (1) characterized by what was constituted by the quality of the material with the larger coefficient of linear expansion than said support base thru/or (4), and (6).
[0020] (8) Said light transmission layer is the inspection approach of the optical recording medium of (1) characterized by consisting of energy-line hardening mold resin or heat ray hardening mold resin thru/or (7).

[0021] (9) Said support base is the inspection approach of the optical recording medium of either (1) characterized by consisting of a polycarbonate or polyolefine thru/or (8).
[0022] (10) Change of the amount of curvatures to the temperature change of said optical recording medium is the inspection approach of the optical recording medium of either (1) characterized by being the variation of the amount within 60 minutes of curvatures after being taken out by the room temperature environment thru/or (9).
[0023] (11) The inspection approach of the optical recording medium of either (1) characterized by taking out said optical recording medium by said room temperature environment, and measuring at intervals of 1 minute till for 10 minutes after measurement initiation of change of the amount of curvatures thru/or (10).

[0024]
[Embodiment of the Invention] The example of the gestalt of operation of this invention is explained to a detail with reference to a drawing below.
[0025] As shown in drawing 1 , on the support base 12 which consists of a polycarbonate (it sets to drawing 1 and is the bottom), variously, by formation of a recording layer or a reflecting layer, the optical recording medium 10 with which the amount change of curvatures is inspected by the inspection approach concerning the example of the gestalt of this operation is made into record and/or a refreshable condition, and forms the light transmission layer 24.
[0026] Said support base 12 is formed by injection molding of resin, such as a polycarbonate and polyolefine, here, and the thickness is set to about 1.1mm. Here, the reflective film 16, the 2nd dielectric layer 18, a recording layer 20, and the 1st dielectric layer 22 are formed in this order by the sputtering method on this as an example.
[0027] Said light transmission layer 24 may carry out the spin coat of the acrylic resin containing an ultraviolet-rays curing agent, and may form it by pasting up what is formed by irradiating ultraviolet rays and stiffening them, the thing formed with heat ray hardening mold resin, and the resin sheet formed further beforehand. In addition, thickness of the light transmission layer 24 is set to about 100 micrometers.
[0028] Therefore, in conventional CD, conventional DVD, etc., said light transmission layer 24 is formed quite thickly as compared with the protection layer thickness (about 5-10 micrometers) on the resin layer equivalent to the location of the light transmission layer 24 of this optical recording medium 10, i.e., the reflective film.
[0029] Although said reflective film 16 will not be limited if the reflection factor demanded is filled, but it can apply various metallic materials etc., it is using Ag as the principal component here. Although various ingredients could also apply the 1st and 2 dielectric layers 22 and 18, ZnS-SiO2 was used here. Moreover, the recording layer 20 was made into the GeSbTe system which is the recording layer presentation of a phase change mold.
[0030] Since said light transmission layer 24 is formed in the support base 12 made of polycarbonate resin, and one with acrylic resin etc. as mentioned above, a rapid temperature change is in an ambient atmosphere, and when the change is large, curvature generates it for the reasons of the difference in the coefficient of linear expansion in each unit time amount etc.
[0031] By the inspection approach concerning this invention, after saving the optical recording medium which is an inspected object more than for 60 minutes in a 60 degrees C - 80 degrees C ambient atmosphere to the same equipment (illustration abbreviation) with having used by said elevated-temperature retention test, it takes out by the room temperature environment and the amount change of curvatures of an optical recording medium 10 is measured. Said room temperature environment means the ambient atmosphere whose temperature is 23**2 degrees C and whose relative humidity is 50**10%RH here.
[0032] Here, as shown in drawing 2 , from a laser light source 30, measurement of the variation of said amount of curvatures irradiates a laser beam to a record medium 10, receives the reflected light at that time with a semi-conductor position transducer (henceforth, PSD), and detects the amount of curvatures of an optical recording medium 10 with the incidence location to this PSD32 of a reflective laser beam.
[0033] Furthermore, when it sets to the detail so that a reflective laser beam may carry out incidence in the center of PSD32, when an optical recording medium 10 is in a direct flat-surface condition without curvature, as drawing 2 is shown by the broken line, and curvature beta arises in an optical recording medium 10, only 2xbeta increases, this serves as gap of the incidence location of the reflective laser beam of PSD32, and the angle of reflection of a reflective laser beam is detected. Let variation of a from be the variation of the amount of curvatures immediately after making into the amount of curvatures the amount of gaps to said criteria set up beforehand, supplying it beyond fixed time amount to the bottom of an elevated-temperature ambient atmosphere, and taking it out.
[0034] Although a disk does not reach the amount of curvatures which it originally has when the time amount saved in said 60 degrees C - 80 degrees C ambient atmosphere is less than 60 minutes, in any case, the variation of the amount of curvatures became almost fixed, and the amount of curvatures which the disk originally has is reached in 1 hours or more. Therefore, if it is 60 minutes or more, it is stabilized certainly and said variation can be inspected.
[0035] About storage temperature, in the case of 50 degrees C, it was inadequate like the above, and when it was 60 degrees C or more, said variation was able to be inspected.
[0036] Although it will be a waste of energy and will be based also on the ingredient used as an optical recording medium if storage temperature exceeds 80 degrees C, if it exceeds 80 degrees C, in order to have

a bad influence on these ingredients, it is desirable that it is 80 degrees C or less, and 60 degrees C - 80 degrees C are efficient. Desirably, it is good to save at 70 degrees C.
[0037] According to research of this invention person, the time amount which change of steep curvature generates has been less than 10 minutes since the optical recording medium was taken out from the above preservation conditions by the room temperature environment, but if it is less than 60 minutes, steep curvature will occur in the time zone certainly. Moreover, when the patient throughput was taken into consideration, and taking out the optical recording medium from storage temperature to the room temperature average and measuring the amount of curvatures for 20 minutes, steep curvature was able to be detected almost certainly.
[0038] In addition, in the example of the gestalt of the above-mentioned implementation, although the light transmission layer 24 is formed from acrylic resin This invention is what is generally applied to inspection of the optical recording medium using the intense ingredient of telescopic motion by the rapid temperature change in a short time. In a light transmission layer it is variously selectable out of the energy-line hardening mold resin hardened with energy lines, such as ultraviolet rays, and the heat ray hardening mold resin hardened with heat, and acrylic resin, epoxy system resin, urethane system resin, etc. are applicable -- certain **
[0039] Furthermore, although thickness of said light transmission layer 24 is set to 100 micrometers, this invention is applied to the optical recording medium with which the light transmission layer with a thickness of 20-150 micrometers is prepared again.
[0040] 20 micrometers of said minimum value have little telescopic motion according [the case of the thickness not more than this] to a temperature change, and the maximum of 150 micrometers is determined from relation with the minimum clearance distance in which it approves between the distance of the objective lens of the optical head at the time of informational record/playback, and said recording layer 20, and this objective lens and optical recording medium 10.
[0041] Moreover, when the amount variation of curvatures by moisture absorption of the support base 12 is large, the moisture-proof film may be prepared.
[0042] In addition, polyolefine etc. may be used as an ingredient of said support base 12 in addition to a polycarbonate like the example of the gestalt of operation.
[0043]
[Example] [Example 1] If shown in said drawing 1 , the same optical recording medium will be taken out at 70 degrees C by the room temperature environment (21-25 degrees C and 40 - 60% of relative humidity) after 30 minutes, 1 hour, 2 hours, and aging (preservation) of 24 hours. When shown in said drawing 2 R> 2, the variation of the amount of curvatures was measured by the same measuring method, the axis of ordinate was set as the variation, the axis of abscissa was set as the time amount from measurement initiation, and it expressed to drawing 3 . In addition, the amount of curvatures immediately after taking out from under hot environments here was set to 0, and the difference from there was compared.
[0044] As drawing 3 also shows, it turns out that contraction of a light transmission layer and the contraction balance of a support base collapse by heat dissipation within 10 minutes after measurement initiation, and it generates steeply [curvature] and greatly except for the case where a reserve time is 30 minutes, by this.
[0045] Furthermore, when heat dissipation attains to the whole, it turns out that distortion by heat leakage is quickly canceled in [10 minutes -] 60 minutes in drawing 3 .
[0046] A measurement result is shown [an example 2 and [example 3] storage temperature] for other conditions in drawing 4 and drawing 5 like an example 1, respectively as 60 degrees C (example 2) and 80 degrees C (example 3).
[0047] These drawing 4 and drawing 5 also show that the same inclination as an example 1 is seen.
[0048] [Example of a comparison] After aging storage temperature to said example as five steps, 30 minutes, 1 hour, 2 hours, 3 hours, and 8 hours, and taking out 50 degrees C and a reserve time by the room temperature environment, the result of having measured the variation of the amount of curvatures like the above is shown in drawing 6 . [0049] Curvature has occurred within 10 minutes after measurement initiation so that drawing 6 may also show, but although this is the same optical recording medium as the case of an example 1, it is thought that the variation of the amount of the maximum curvatures is small, and has not reached the amount of curvatures of disk original.
[0050]
[Effect of the Invention] Since this invention was constituted as mentioned above, it has the outstanding effectiveness that the variation of the steep amount of curvatures by the temperature change of an optical

recording medium is certainly detectable effectively in a short time.

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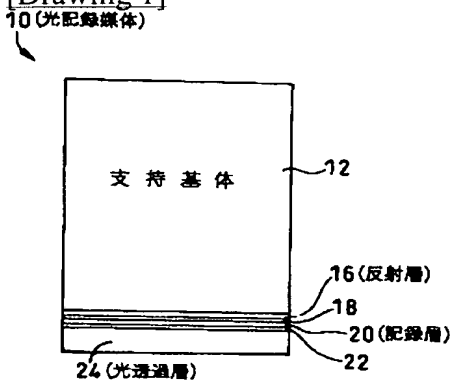
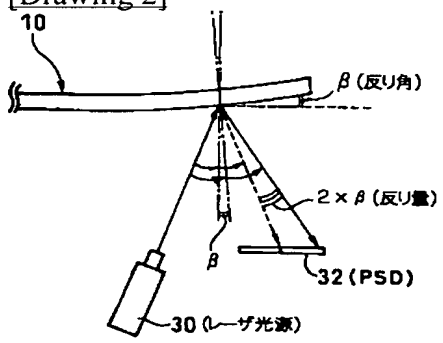
DRAWINGS

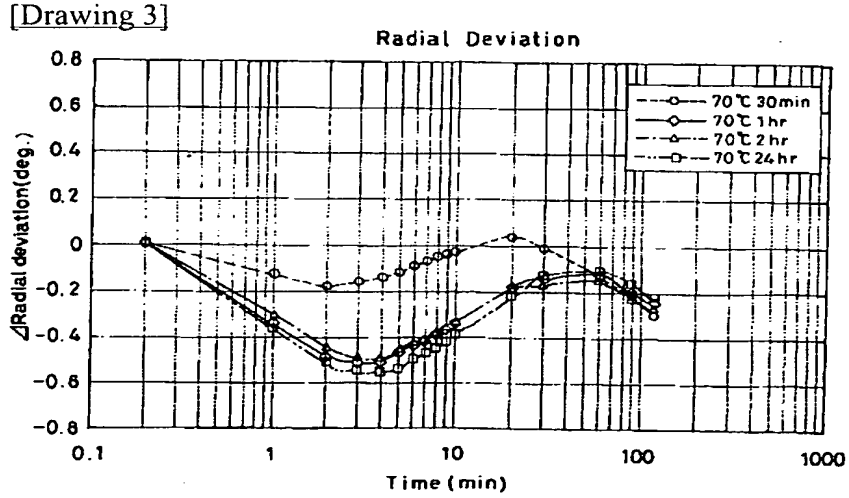
[Drawing 1]



[Drawing 2]



[Drawing 3]



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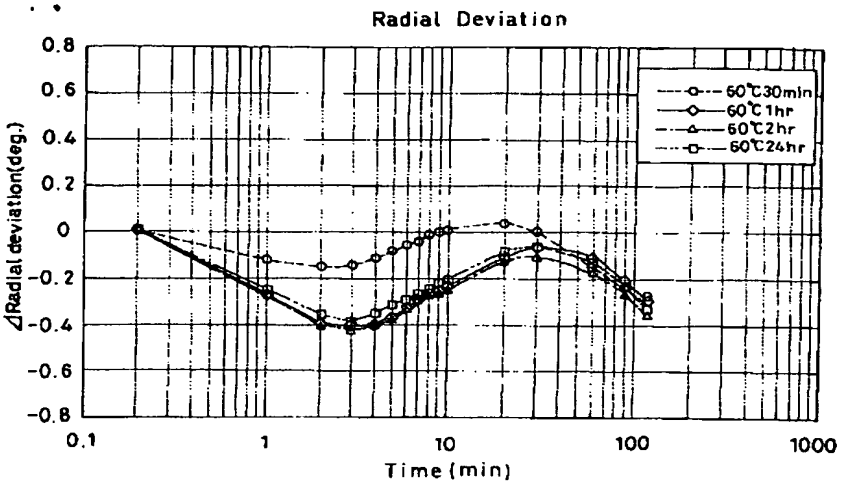

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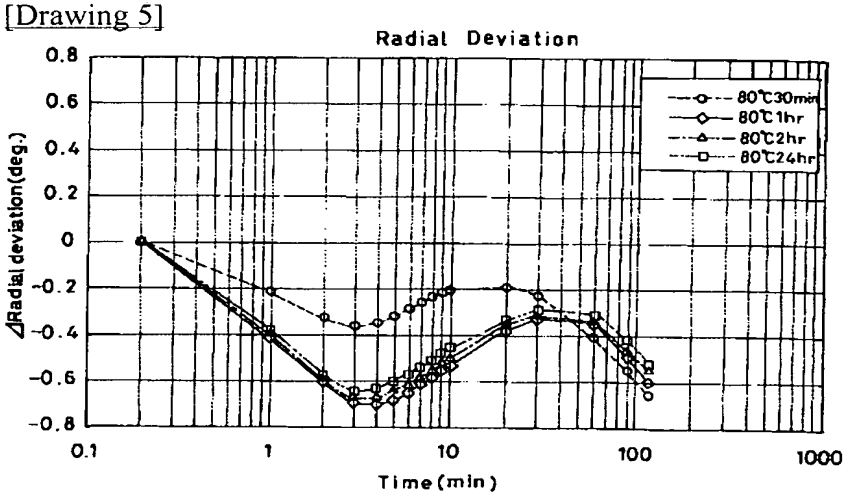
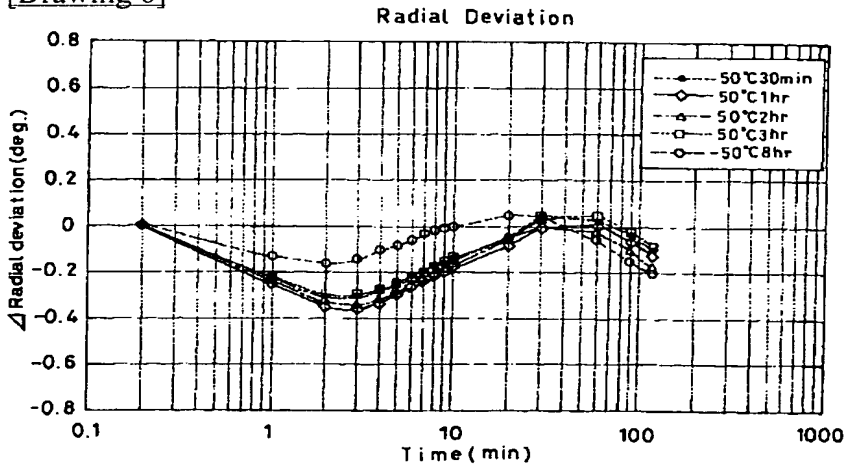


[Drawing 6]



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